MATERIAL SAFETY DATA SHEET

SRM Supplier: **National Institute of Standards and Technology**
Standard Reference Materials Program
Bldg. 202 Rm. 211
Gaithersburg, Maryland 20899

SRM Number: 4404L
MSDS Number: 4404L
SRM Name: Thallium-201 Radioactivity Standard
Date of Issue: 24 January 2000

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SECTION I. MATERIAL IDENTIFICATION

Material Name: Thallium-201 Radioactivity Standard

Description: SRM 4404L consists of radioactive thallium-201 nitrate, non-radioactive thallium nitrate, and nitric acid dissolved in 5 mL of distilled water. The resulting solution is 6 % nitric acid.

Other Designations: **Thallium** in **Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engravers acid) **Solution**

Name	Chemical Formula	CAS Registry Number
Nitric Acid	HNO_3	7697-37-2

DOT Classification: Nitric Acid, UN2031

Manufacturer/Supplier: Available from a number of suppliers.

SRM 4404L is a radioactive material with a massic activity of approximately 10 MBq·g^{-1}. The hazard information supplied in this MSDS is for the Chemical Hazard Only! For the hazard documentation concerning the radioactive material, refer to the SRM certificate.

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	6	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m^3
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m^3
		Human, Oral: LD_{LO}: 430 mg/kg

NOTE: This material contains thallium at a nominal concentration of 0.005 %, which is below the reportable limit (0.1 % for carcinogens, 1 % for all other health hazards) required by OSHA according to 29 CFR 1910.1200(g)(2)(i)(C)(1).

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid
Appearance and Odor: A white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; a strong, pungent odor
Relative Molecular Mass: 63.02
Density: 1.03 (6 % nitric acid)
Solubility in Water: Soluble
Solvent Solubility: Decomposes in alcohol

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A **Method Used:** N/A **Autoignition Temperature:** N/A

Flammability Limits in Air (Volume %): **UPPER:** N/A
LOWER: N/A

Unusual Fire and Explosion Hazards: Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: **__X__ Stable** **_____ Unstable**

Conditions to Avoid: Avoid contact with incompatible materials.

Incompatibility (Materials to Avoid): Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide.

See Section IV**:** *Unusual Fire and Explosion Hazards*.

Hazardous Decomposition or Byproducts: Hazardous decomposition of nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO_2), nitrous oxide (N_2O), as well as nitric acid mist or vapor.

Hazardous Polymerization: **_____ Will Occur** **__X__ Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: **X** **Inhalation** **X** **Skin** **X** **Ingestion**

Health Hazards (Acute and Chronic): Nitric acid may be fatal if inhaled, swallowed, or absorbed through the skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Medical Conditions Generally Aggravated by Exposure: Eye disorders, respiratory disorders, skin disorders, and allergies.

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain medical assistance if necessary.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

NOTE: Wash affected skin areas with 5 % solution of sodium bicarbonate ($NaHCO_3$). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

TARGET ORGAN(S) OF ATTACK: **Nitric Acid:** Skin, teeth, eyes, and upper respiratory tract.

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released or Spilled: Notify safety personnel of spills. Spills should be handled according to radioactive spill procedures.

Waste Disposal: Follow all federal, state, and local laws governing disposal of radioactive materials.

Handling and Storage: Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for non-routine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. The

sample container should be handled by persons qualified to handle both radioactive material and strong acid solutions.

> **NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

This material should be stored and used at a temperature between 5 °C and 65 °C.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Nitric Acid*, June 2, 1999.
Merck Index, 11th Ed., 1989.
The Sigma Aldrich Library of Chemical Safety Data, Ed. II, 1988.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.